



## **Katadyn – Combi Microfilter**

[www.katadyn.com](http://www.katadyn.com)

### **Device Information**

The Katadyn Combi Microfilter is a handheld pump water treatment device utilizing ceramic microfiltration. The ceramic element is a field cleanable 0.2  $\mu\text{m}$  depth filter with silver impregnation. This device is designed for bacteria and cyst reduction, but contains no reduction mechanism for virus. The manufacturer recommends a chemical disinfectant be added if viruses are suspected in the water source. The device, as purchased, contains two packs of granular activated carbon designed to reduce taste and odor, as well as reduce chemicals possibly found in the raw water source. The use of carbon is optional, and is not considered a primary mechanism for the reduction of microbial pathogens. The carbon is stated to last about 200 L or 6 months, depending on raw water quality. The device consists of a plastic housing and pump, ceramic filter element, activated carbon, inlet and outlet tubing, tubing weight and float, and 130  $\mu\text{m}$  pre-filter. Additionally, the device comes with a filter element scrubbing pad, ceramic element measuring gauge, pump lubricant, bottle adaptor, extra o-rings, and a storage bag. The weight and float work together to keep the inlet tubing submerged, yet off of the bottom of the raw water source, to limit the introduction of sediment. The ceramic element silver impregnation is designed to limit bacterial growth on the element. This device creates an absolute barrier to contaminants greater than the pore size. No chemicals and no wait time are required for use. Prior to first use, and after prolonged storage, the manufacturer recommends discarding a small amount of water to reduce stale taste. This device is fully field serviceable, and can be disassembled without tools. Additionally, Katadyn offers a carbon cartridge bottle attachment that can be added to the effluent tubing for taste and odor reduction. This device is capable of being attached to a pressurized source (e.g., municipal tap), utilizing system pressure to process water (device termed Katadyn Combi Plus with this accessory). Device flow rate, etc., using this optional accessory, will depend on characteristics of pressurized source and are not addressed in this evaluation.

### **Effectiveness Against Microbial Pathogens**

No results were obtained that challenged this device strict to the requirements of the U.S. Environmental Protection Agency (USEPA) Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 1). Results from an independent laboratory study (reference 2) were reviewed that challenged the Katadyn Mini (a filtration device manufactured by Katadyn, utilizing a ceramic filter cartridge identical to the Combi, except smaller in size) against a modified version of reference 1. No information was supplied as to the flow rate used

during testing, and total production during testing was 200 L. Under these modified protocol conditions, data showed that the Mini was capable of meeting the log reduction requirements for bacteria and *Cryptosporidium* oocysts. This testing did not challenge the device against *Giardia* cysts or viruses. Since the primary reduction mechanism is size exclusion, and because *Giardia* cysts are larger in size than *Cryptosporidium* oocysts, similar results for *Giardia* reduction can be assumed. Viruses are too small to be removed by the ceramic element used in these filtration devices. Very little information was received on the testing procedure. It was noted that during testing, the Mini required cleaning with the supplied scouring pad at every test point, stating also that the device tended to clog very easily. Results state that flow improved considerably after cleaning, but that as more water was passed through the device, cleaning was required more often. Due to the testing modifications with respect to reference 1, and the lack of data specific to the Combi, this evaluation based reduction capabilities on treatment technology. Therefore, this device is assigned one √ for bacteria and cyst reduction (for an explanation of the rating checks [click here](#)) based on size exclusion by the ceramic microfilter. Since the device is not designed, and has no mechanism, for virus reduction, the device is assigned one X for this pathogen. Additional treatment is required for virus reduction.

**Table. Expected Performance Against Microbial Pathogens.**

Microbial Pathogen Type	Expected Disinfection Capability	Evaluation Rating	Pathogen Reduction Mechanism
Bacteria	>6 log	√	size exclusion
Viruses	not effective*	X	none
<i>Giardia</i> cysts	>3 log	√	size exclusion
<i>Cryptosporidium</i> oocysts	>3 log	√	size exclusion

\* additional treatment required for virus reduction.

### Production Rate and Capacity

Inherent to the production rate and capacity of filtration devices is the quality of the raw water source. The manufacturer stated production capacity of the device is up to 50,000 L at a rate of 1.0 L/min. Since cleaning irreversibly decreases the size of the element, the overall capacity of this device will vary widely with raw water turbidity. No data was received showing the number of times this device can be cleaned before ceramic element replacement is required.



Additionally, since the available data only processed 200 L, and with no indication of challenge water turbidity, no estimation of actual production capacity can be made.

#### Cleaning, Replacement, and End of Life Indicator

This device utilizes a ceramic depth microfilter which can be cleaned by scrubbing the surface of the filter element to remove accumulated debris. Given the small pore size of the ceramic element, it is expected to clog frequently during use with turbid waters and is therefore designed to be cleaned multiple times throughout its useful life. As stated above, the Katadyn Mini underwent multiple cleanings during the 200 L microbial challenge testing. Since the ceramic element used during testing was smaller than this device, production volume prior to required cleaning is expected to be greater but cannot be quantified. The report (reference 2) states that cleaning restored the production rate considerably and did not affect pathogen reductions. Supplied with the device is a gauge that is placed over the ceramic element. If the gauge fits around the element then the filter has been cleaned to its capacity and must be replaced. Since the device works solely on size exclusion, as long as the device will process water and the element is not determined to be too thin, stated pathogen reductions should be valid. When the filter begins to clog and pumping difficulty increases, the user should discontinue use and clean the ceramic element. This device does not contain a pressure relief valve, allowing for the possibility of the user over pressurizing the filter and damaging the seals. Since activated carbon is not considered a primary pathogen reduction mechanism, continuing use after the carbon capacity is exhausted, or using the device without carbon, should not affect microbial water quality.

#### Weight and Size

Katadyn Combi Microfilter	600 grams
Size (height x diameter)	27 cm x 8 cm
Tubing	107 cm

#### Cost

Katadyn Combi Microfilter	\$140.00
Replacement ceramic element	\$75.00
Replacement activated carbon	\$9.00

#### Device Evaluation

The Katadyn Mini Microfilter utilizes a 0.2  $\mu\text{m}$  silver impregnated ceramic element for the reduction of bacteria and cysts. The silver impregnation is designed to limit microbial growth on



the ceramic element. No data was received regarding the efficacy of this bacteriostatic design. Microbial reduction data reviewed for a similar device manufactured by Katadyn (reference 2), tested against an abbreviated version of the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 1), showed that this device should be capable of reducing bacteria by > 6-log, and cysts by > 3-log. No information was given as to the exact testing conditions and the volume of water treated during testing was far less than the stated capacity of the device. This device contains no virus reduction mechanism and, therefore, no testing was performed for this pathogen. Additional treatment is required to fully meet the requirements of reference 1 and ensure adequate reduction of all three classes of microorganism. Since size exclusion by ceramic microfilter elements is a generally accepted mechanism for pathogen reduction, we expect this device to adequately reduce bacteria and cysts in accordance with reference 1 and recommend additional treatment for virus reduction (reference 3). Activated carbon use is optional for this device and is expected to reduce taste and odor, but have no appreciable impact on microbial reduction. The testing results received note the requirement for multiple cleanings. Due to the small pore size, ceramic element cleaning is expected, increasing in frequency with increasing raw water turbidity. Results showed consistent pathogen reductions after cleaning (reference 2). It is expected that pathogen reductions will remain consistent throughout the useful life of the device. This device utilizes no chemicals and requires no wait time prior to water consumption. There is no indicator of process failure. A plastic gauge acts as an end of device useful life indicator. Since, during cleaning of the ceramic element the filter reduces size, when the gauge fits around the filter it must be replaced. This device, like all containing ceramic elements, must not be frozen while wet. Expansion of the water during freezing may crack the element. Additionally, the user should avoid shocking the device due to the brittle nature of ceramic elements and possible fracturing during shock loads. No manufacturing information or quality control data was received for this device. The manufacturer states ISO 9000 certification. No information was received on the storage life or required storage conditions for this device.

### Advantages

- Based on treatment technology and independent data reviewed, this device should be capable of reducing bacteria and cysts to within the requirements of the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 1).
- No wait time prior to water consumption.
- Field-serviceable.
- End of device useful life indicator.



### Disadvantages

- Device is not designed for virus reduction and, therefore, unable to fully meet the pathogen reduction requirements of the USEPA Guide Standard and Protocol for Testing Microbiological Water Purifiers (reference 1).
- Additional treatment required.
- Small pore size of filter makes device inherently susceptible to clogging by waters with elevated turbidities.
- Ceramic element fragile to shock loads and freezing.
- No real-time indicator of process failure.

### References

1. USEPA, 1989. Guide Standard and Protocol for Testing Microbiological Water Purifiers. *Federal Register*. 54:34067.
2. Independent laboratory results of tests showing bacteria and cyst reduction, 1995. Provided by Katadyn.
3. U.S. Army Center for Health Promotion and Preventive Medicine, 2005. *Technical Information Paper; Filtration in the Use of Individual Water Purification Devices*, Aberdeen Proving Ground, MD.

